

Advanced Manufacturing Technologies (AMT): Modular Rapidly Manufactured SmallSat Element

Game Changing Development Program | Space Technology Mission Directorate (STMD)



ABSTRACT

Utilize advanced manufacturing processes to design and fabricate a fully functional prototype flight model, with the goal of demonstrating rapid on-orbit assembly of a modular Small Satellite.

ANTICIPATED BENEFITS

To NASA unfunded & planned missions:

Enables the ability to develop, investigate, create and test new ideas and knowledge that otherwise will not be given the opportunity to flourish and be developed.

DETAILED DESCRIPTION

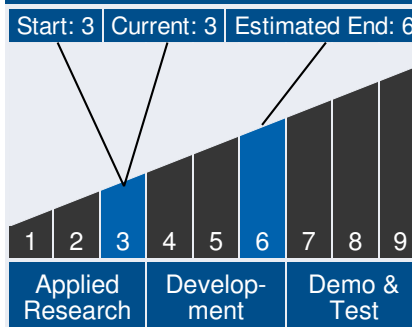
Rapidly fabricated, modular and integrated small satellite subsystems will be developed from digital fabrication workflows. The following are planned modular components: Cube Satellite structure using state-of-the-art advanced manufacturing technologies, techniques, and materials Modular "Digital Material" technology for spacecraft subsystems and components to maximize payload volume Modular computing architecture to be used with Commercial Off the Shelf (COTS) microcontrollers Digital repository of widely accessible, easy to replicate and modify satellite components



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Technology Maturity



Management Team

Program Executive:

- Ryan Stephan

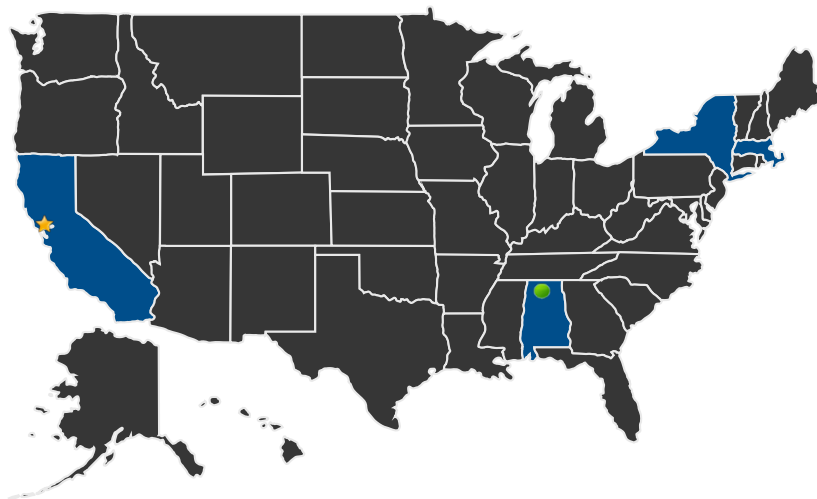
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U.S. WORK LOCATIONS AND KEY PARTNERS



■ U.S. States
With Work

★ **Lead Center:**
Ames Research Center

● **Supporting Centers:**

- Ames Research Center
- Marshall Space Flight Center

Other Organizations Performing Work:

- Massachusetts Institute of Technology

Contributing Partners:

- Cornell University
- Massachusetts Institute of Technology
- San Jose State University (SJSU)

Management Team (*cont.*)

Program Manager:

- Stephen Gaddis

Project Manager:

- John Vickers

Principal Investigator:

- Lanetra Tate

Technology Areas

Primary Technology Area:

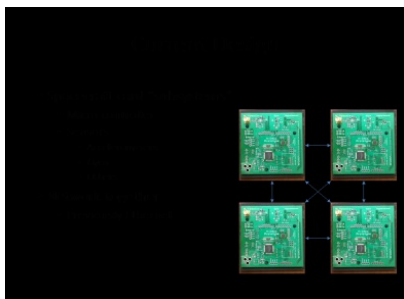
Materials, Structures, Mechanical Systems and Manufacturing (TA 12)

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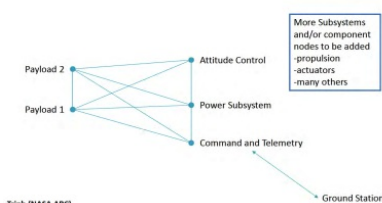
IMAGE GALLERY



Spacecraft card "subsystems" and Network Together

Modular Rapidly Manufactured Small Sat
STMD GCD Advanced Manufacturing Technologies / MIT / NASA Ames Research Center

Wireless Mesh Network Topology



Wireless Mesh Network Topology
(Modular Rapidly Manufactured Small Sat)

DETAILS FOR TECHNOLOGY 1

Technology Title

Advanced Manufacturing Technologies: Modular Rapidly Manufactured SmallSat

Technology Description

This technology is categorized as a hardware system for unmanned spaceflight

- Demonstration of the use of mesh networks-the Team design a mesh network subsystem cards that can transfer information or power by using using a *flooding* technique or a *routing* technique. When using a routing technique, the information or power is propagated along a path, by *hopping* from node to node until the destination is reached. This subsystem will only use to nodes as demonstration technology.
- Demonstration of the rapid, cost-effective development and integration of 1U+ for proto-flight. The Team will demonstrate the rapidly fabricated, modular and integrated small satellite systems in the International Space Station using the advance manufacturing technologies, techniques and materials.
- Spacecraft card subsystems- The team will develop boards that will have a microcontroller and sensor and will be in depended from each other

Capabilities Provided

This Technology will demonstrate the rapidly fabricated, modular and integrated small satellite systems in the International Space Station and ground using the advance manufacturing technologies, techniques and materials.

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Potential Applications

This Technology will enable rapid assembly in Space and Ground of small satellites as a ground breaking but in the future could be unitize for large structures to be assembly in ISS, in other planted or in Space.